THE PRESENT STATUS OF PSEUDODIPHTHERIA BACILLI.

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A committee was appointed in July, 1900, by the Massachusetts Association of Boards of Health to investigate the occurrence of diphtheria bacilli in well persons. It was found at the outset of their work that there existed such a wide divergence of opinion as to the identity of diphtheria-like bacilli that it became necessary, in collecting data, to make use of an arbitrary classification which included many doubtful types.

A glance backward will show that this uncertainty as to the precise status of diphtheria-like organisms has existed since the discovery of the specific cause of the disease. In his second communication on the etiology of diphtheria, Loeffler described the pseudodiphtheria bacillus as a non-pathogenic organism, interesting chiefly for its resemblance to B. diphtheriæ. Von Hofman, Vincent, Roux and Yersin, and others subsequently found it in the throats of healthy children and of those ill with measles, scarlet fever, nasal catarrh, and laryngitis. A controversy arose as to whether the organism was a distinct variety with no relation to B. diphtheriæ or a variant of it, lacking virulence, but in other respects identical. A few investigators took the latter view, notably Roux and Yersin, who supported it in a paper published in 1890. They defended this position with much force, pointing out that less difference existed between diphtheria bacilli and pseudodiphtheria bacilli than between virulent and attenuated anthrax bacilli obtained from the same source.

At the present time bacteriologists are divided into three groups by their opinions on this question.

1. Perhaps the greater number in this country believe that the term pseudodiphtheria bacilli should be applied only to that group of non-virulent organisms which resemble diphtheria bacilli very closely, but which may be distinguished from them by certain cultural or morphological characteristics. They regard diphtheria bacilli which produce toxin and those which do not as variants of the same organism.

2. A lesser number of bacteriologists in America and many Continental observers, including Roux and Yersin and Behring, believe in the identity of diphtheria bacilli and the so-called pseudodiphtheria bacilli, and regard the latter solely as varieties of B. diphtheriæ. Dr. F. F. Wesbrook, of Minnesota, divided all diphtheria bacilli into granular, barred, and solid forms, according to their appearance when grown on blood serum and stained with Loeffler's methylene blue. These forms he has further divided into types with reference to their shape and size.

The drawings which he presented with his descriptions leave no doubt that he considers several forms often classed as pseudodiphtheria bacilli undoubted diphtheria bacilli. His classification was that adopted by the committee of the Massachusetts Association of Boards of Health in the investigation previously referred to.

3. A few observers still apply the name pseudodiphtheria bacilli to those which are identical with diphtheria bacilli, with the single exception of being non-virulent, as well as to those which show cultural differences.

As might be expected, many methods have been devised to separate true diphtheria bacilli from those resembling them. A few biological differences have been observed. In glucose bouillon one distinction was found by some to be constant. All virulent diphtheria bacilli and some non-virulent ones are said to produce acid when grown in this medium, while pseudodiphtheria bacilli either produce no acid or produce it after a few hours' growth, and then rapidly produce alkali. The experience of different observers has differed greatly as to this, and it has been pointed out that their technique has been too dissimilar for a fair comparison of their results, and that, moreover, avirulent diphtheria bacilli cannot in many cases be distinguished from pseudodiphtheria bacilli by this means.

Neisser's method of staining the polar granules was hailed as a certain means of identifying true diphtheria bacilli, but it has been shown that not all virulent diphtheria bacilli possess polar granules, and that many avirulent diphtheria bacilli are without them, staining solidly. Furthermore, some pseudodiphtheria bacilli, even when grown less than twenty hours, have polar granules which stain beautifully by Neisser's method. Pioskowski's method is open to the same objection.

It has been noticed that these polar bodies develop more rapidly in true diphtheria bacilli than in the bacilli which most resemble them. The character of the emulsion resulting from mixing a colony with a few drops of water and several other apparently distinctive features have been described, but they have not been found equally reliable by different experimenters. And so we are obliged to say to-day that there are no methods of identifying true diphtheria bacilli which are regarded as trustworthy by all those who have devoted special attention to the subject.

The matter is not one of importance to laboratory workers alone, but has serious bearing on the control of diphtheria. One of the most vexing questions which confronts public health officers is the proper disposal of well persons infected with diphtheria bacilli, and this uncertainty about a matter so fundamental complicates it exceedingly. At present there is little difficulty in isolating persons who have had diphtheria until the bacilli can no longer be found in cultures from their throats.

In some cities a more or less successful attempt is being made to detain or throw some safeguards about those who have been directly exposed to the disease and who have infected throats, but no one has yet ventured to suggest that those well persons who carry diphtheria bacilli and who have not been directly exposed to the disease should be detained until their throats are free from infection. If we are to believe that all the so-called pseudodiphtheria bacilli are variants of true diphtheria bacilli, we must regard so large a part of the population infected that it is unfair to detain the few whom our bacteriological examinations detect, and it may even be held by some, as it is said to be by Behring, that it is unjustifiable to isolate even those suffering from the disease. It may be urged that the non-virulent forms may be disregarded, but even if it were practicable to test all cultures for virulence, animal inoculations afford us no positive assurance that, transferred to the throat of a non-resisting person, the bacilli might not cause disease. On the other hand, if such well-defined differences are observed in the growth or morphology of the organisms that it may be demonstrated that they constitute two or more distinct varieties, bearing no relation to each other, the problem of dealing with persons infected with B. diphtheriæ will be immensely simplified. It will then be entirely practicable to isolate all well persons in infected families who bear the germs and to compel others to take reasonable precautions against spreading the disease.

The matter is of so much importance that every effort should be made by bacteriologists to meet upon common ground in classifying diphtheria-like bacilli. Reports on cultural peculiarities should be so complete that one who has used somewhat different methods, and thereby failed to arrive at a similar result, should not be at liberty to deny the validity of another's conclusions.

As none doubts that if the organisms are identical all varieties must have had their origin in cases of clinical diphtheria, investigations should be made in places where diphtheria has not recently prevailed. Too many such examinations have been made in cities where diphtheria is endemic, and in jails, schools, and asylums, and too few in those country hamlets remote from railways, where, as far as the memory of the oldest physician serves, no case of diphtheria has occurred.

Careful observation of the morphology of diphtheria-like bacilli will probably be of greater value than a study of cultural differences. Dr. Wesbrook's classification, if enlarged to include a few types which cannot be conveniently grouped with any of his, forms a most admirable basis for comparison, and the water-colored drawings which accompanied his original article may well serve as models of accuracy.

In examinations made for the diagnosis of diphtheria it is rarely that the decision depends upon differentiating diphtheria bacilli and pseudodiphtheria bacilli; but when we are called upon to determine the presence of diphtheria bacilli in well persons the difficulty is often insurmountable.

It is because any data, however fragmentary, which bear upon an important subject have a certain value that I present a few observations on the morphology of a single variety of pseudodiphtheria bacillus.

Diphtheria has prevailed at the Willard State Hospital since 1899. In the management of the epidemic it is considered of much importance to isolate all well persons among the inmates in whose throats or noses diphtheria bacilli may be found. To this end as great a number of cultures as the facilities of the laboratory permit are taken from the 2700 employés and patients residing in the institution. In 17,509 cultures from 1423 well persons which I have examined during the last year, undoubted diphtheria bacilli were found in 189 cases. The cultures were all grown overnight on blood serum. The large number of cultures does not permit plating each "suspicious" one or close study on different media, and so it has been necessary to adopt some rather arbitrary method of deciding which organisms found are diphtheria bacilli and which are not. As absolute uniformity in the conditions of growths exists, this plan has been followed by more success than might be imagined. In all cases in which considerable doubt is felt, another culture is taken and some special methods of growth employed, but in the vast majority of cases the decision is made from the morphology of the organisms present in the first cover-slip preparation.

The fact which, after this number of examinations, seems most prominent is that there is one variety at least of the diphtheria-like bacilli which possesses a constancy of form and distribution which entitles it to separate consideration. To avoid confusing it with a form to which several names have been applied, it may be termed, for the moment, "type a."

OCCURRENCE. It has been found at the Willard State Hospital so frequently in the nose that it has come to be regarded as a normal inhabitant of that part. In a series of 100 cultures from the nose it is very common to find it in 25, and sometimes in 60, in most cases predominating in numbers over all other bacteria present. In a few cases I have found it in cultures in which were undoubted diphtheria bacilli, but all of these were from well persons, and I have not yet seen it in cultures taken from those suffering with diphtheria. It has been found in the throats of those in whose nose cultures it was present the same day and on other days, and, in somewhat less than 1 per cent. of all cultures examined, it has been found only in the throat. In many instances a culture from the nose shows no other organism; in a large number of cultures, staphylococci and "type a" are present together. In certain persons this organism is so constantly present that in cultures taken months apart it is possible to predict the finding with certainty, while many individuals have had cultures taken repeatedly and "type a" never found.

VIRULENCE. I have inoculated only a few guinea-pigs and no other laboratory animals with cultures of this bacillus. None of the animals inoculated with pure cultures which died showed evidences of illness or of local reaction.

MORPHOLOGY. This bacillus shows less variation in size, shape, and staining than any other of the non-pathogenic bacteria found in the throat or nose. Whether the culture be from the nose, or the throat the morphology is the same. It is a moderately thick bacillus usually composed of two deeply stained segments separated by an unstained portion. The entire bacillus commonly forms an elongated ellipse. The segments are joined base to base, and each is spade-shaped rather than lancet-shaped. The segments are apt to be equal in length, although often one is longer than the other. When this is the case the shorter one is usually thicker than the other. The unstained portion is just perpendicular to the long axis of the bacillus, and narrow and uniform in width. In some cultures about every eighth or tenth bacillus does not present this segmented appearance, but forms an evenly stained ellipse. In cultures which have grown longer than eighteen hours there is a tendency for the ends to take the stain a trifle more intensely than other portions, but after twelve or fifteen hours the bacillus stains deeply and evenly with Loeffler's alkaline methylene blue. The arrangement is not quite as irregular as that of B. diphtheriæ, four or five bacilli often arranging themselves like the spokes of a wheel. Fig. 1 shows "type a" drawn from a cover-slip preparation. It is exceedingly common to find diphtheria bacilli, even in initial cultures from clinical cases, which resemble this bacillus closely, and yet, in the greater number of such instances there is enough difference in the morphology to distinguish between them. When such bacilli occur in pure cultures of B. diphtheriæ they resemble the forms shown in Fig. 2, which is drawn to a smaller scale. The inequality in the two segments is greater, the

FIG. 1.

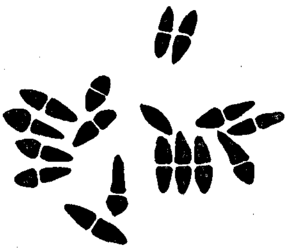
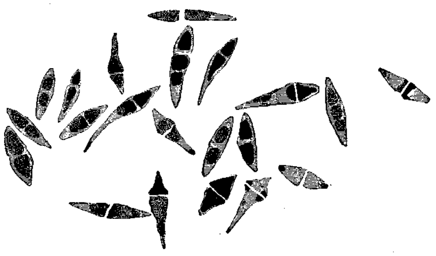


FIG. 2.



ends are more pointed, the sides are more concave, and the stain is rarely taken as evenly as by "type a."

This is not a complete description of the morphology of this type, but a few observations concerning a bacillus well known, often encountered, and variously named. If it can be generally agreed that this is a distinct variety, bearing no relation to B. diphtheriæ, and a distinctive name is given it, a great deal will be gained in classifying diphtheria-like bacilli, for it is certain that this organism is responsible for more difference of opinion in the examination of cultures from well persons than any other of the pseudodiphtheria bacilli.

A REPORT OF THREE MEDICOLEGAL CASES INVOLVING THE DIAGNOSIS OF CHRONIC DELUSIONAL INSANITY.[1]

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My present purpose is not to discuss *in extenso* chronic delusional insanity, but merely to report briefly three medicolegal cases encountered in practice during the past year, in which the diagnosis mainly involved a consideration of that particular form of alienation, and, finally, to enunciate certain diagnostic criteria deducible from the histories presented.

Case I.—B. C. (seen at Detention Hospital), aged forty-two years, married, coal-dealer; correct habits, general health and family history good; came to Chicago from Germany at the age of fourteen, and soon after twenty started in business successfully for himself and proposed marriage to a former schoolmate, who accepted his offer, coming from the old country to consummate the ceremony. The union was a fruitful and happy one. Both were active and consistent church members, their clergyman often citing theirs as the model family of his rather large congregation.

About two years prior to the date of my visit B. C. returned home, not by design, but quite unexpectedly, however, and found D. alone in the family bedroom with his wife; the children all on the floor below by order of the mother, and she sitting on the bed, which had the appearance of having been used; D.'s clothing was disarranged. Now, D. had gone to school in the old country with both B. C. and his wife, and had accompanied the latter on her voyage to this country, and B. C. had given him work some years before, which threw the suspected parties much together, as B. C.'s residence stood in the yard where D. was employed. B. C. said he could have killed D. then and there, but refrained from making a scene on account of his family. D. never came to the house again, though he had formerly been a frequent visitor there.

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[1] Also sometimes designated monomania, paranoia, and reasoning insanity. Read at the Illinois State Medical Association, April 29, 1903.